

What Is Claimed Is:

1. 1. A method for determining an exposure gap between a mask and a resist material wherein the
2 resist material is exposed to an incident energy transmitted through exposure regions of the mask,
3 comprising:
 - 4 providing first gratings on one or more sides of a first structure defined by one or more first
5 regions of the mask;
 - 6 providing second gratings on one or more sides of a second structure defined by one or more
7 second regions of the mask;
 - 8 exposing said first and said second structures to the incident energy;
 - 9 measuring a difference between a location in said first structure and a location in said second
10 structure; and
 - 11 determining the exposure gap from said difference.
1. 2. A method according to claim 1, further comprising:
 - 2 using a mask writing tool to provide said first gratings and said second gratings.
1. 3. A method according to claim 1, wherein providing said first gratings comprises:
 - 2 providing gratings on an edge of an internal box structure defined by said one or more first
3 regions, and
 - 4 wherein providing said second gratings comprises:

5 providing gratings on an edge of an external box structure defined by said one or more
6 second regions located opposite from said adjacent edge of said internal box structure.

1 4. A method according to claim 1, wherein providing said first gratings comprises:
2 providing gratings on a pair of opposite edges of an internal box structure defined by said one
3 or more first regions, and
4 wherein providing said second gratings comprises:
5 providing gratings on a first edge of said internal box structure and on a second edge of an
6 external box structure defined by one of said second regions, said first and said second edge being
7 located opposite from one another.

1 5. A method according to claim 1, wherein providing said first gratings comprises:
2 drawing a plurality of pattern lines having relatively thin width portions and relatively thicker
3 finger projectile portions on a semiconductor resist material, said thin width portions and said finger
4 projectile portions placed in an adjacent manner to form a comb-like pattern.

1 6. A method according to claim 1, wherein providing said second gratings comprises:
2 drawing a plurality of pattern lines having relatively thin width portions and relatively thicker
3 finger projectile portions on a semiconductor resist material, said thin width portions and said finger
4 projectile portions placed in an adjacent manner to form a comb-like pattern.

- 1 7. A method according to claim 1, further comprising:
 - 2 providing said first gratings and said second gratings to have the same pattern line widths.

- 1 8. A method according to claim 1, further comprising:
 - 2 providing said first gratings and said second gratings to have different pattern line widths
 - 3 from one another.

- 1 9. A method according to claim 1, wherein measuring said first and said second structures
2 comprises:
 - 3 measuring a difference between a center in said first box structure and a center in said second
 - 4 box structure.

- 1 10. A method according to claim 1, wherein determining the exposure gap from said difference
2 comprises:
 - 3 applying an empirical relationship between a given pattern line width, a given exposure gap,
 - 4 and a given line shortening effect to determine the exposure gap.

- 1 11. A method according to claim 10, comprising:
 - 2 using an optical metrology tool to measure center line shifts of said first and said second
 - 3 structures.

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1 12. A method according to claim 10, comprising:

2 using an alignment system of a proximity lithography exposure tool to measure center line
3 shifts of said first and said second structures.

1 13. A method according to claim 1, wherein determining the exposure gap from said difference
2 comprises:

3 exposing one or more test wafers to the incident energy, said one or more test wafers having
4 different tool settings, said tool settings corresponding to one or more different exposure gaps;
5 measuring critical dimensions of said test wafers;
6 creating a calibration chart comparing said tool settings and said critical dimensions; and
7 determining the exposure gap from said calibration chart.

1 14. A wafer for determining an exposure gap between a mask and a resist material wherein the
2 resist material is exposed to an incident energy transmitted through exposure regions of the mask,
3 comprising:

4 first gratings provided on one or more sides of a first structure defined by one or more first
5 regions of the mask;

6 second gratings provided on one or more sides of a second structure defined by one or more
7 second regions of the mask,

8 wherein said first gratings and said second gratings are exposed to the incident energy, and

9 wherein a difference between a location in said first structure and a location in said second
10 structure is measured to determine the exposure gap therefrom.

1 15. A wafer according to claim 14, wherein said first gratings are provided on an edge of an
2 internal box structure defined by said one or more first regions, and
3 wherein said gratings are provided on an edge of an external box structure defined by said
4 one or more second regions located opposite from said edge of said internal box structure.

1 16. A wafer according to claim 14, wherein said first gratings are provided on a pair of opposite
2 edges of an internal box structure defined by said one or more first regions, and
3 wherein said second gratings are provided on a first edge of said internal box structure and
4 on a second edge of an external box structure defined by one of said second regions, said first and
5 said second edge being located opposite from one another.

1 17. A system for determining an exposure gap between a mask and a resist material wherein the
2 resist material is exposed to an incident energy transmitted through exposure regions of the mask,
3 comprising:
4 first device that provides first gratings on one or more sides of a first structure defined by one
5 or more first regions of the mask and second gratings on one or more sides of a second structure
6 defined by one or more second regions of the mask;

7 second device that measures a difference between a location in said first structure and a
8 location in said second structure before and after said first and said second structures have been
9 exposed to the incident energy, and determines the exposure gap based on said difference.

1 18. A system according to claim 17, wherein said second device comprises:

2 device that exposes one or more test wafers to the incident energy, said one or more test
3 wafers having different tool settings, said tool settings corresponding to one or more different
4 exposure gaps;

5 device that measures critical dimensions of said test wafers and creates a calibration chart
6 comparing said tool settings and said critical dimensions; and

7 device that determines the exposure gap from said calibration chart.

8 19. A method according to claim 17, wherein said second device comprises:

9 device that applies an empirical relationship between a given pattern line width, a given
10 exposure gap, and a given line shortening effect to determine the exposure gap.

1 20. A method according to claim 17, comprises:

2 device that uses an optical metrology tool to measure center line shifts of said first and said
3 second structures.